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60/139854	26 Jun 1985	
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(58) Field of search
F1R

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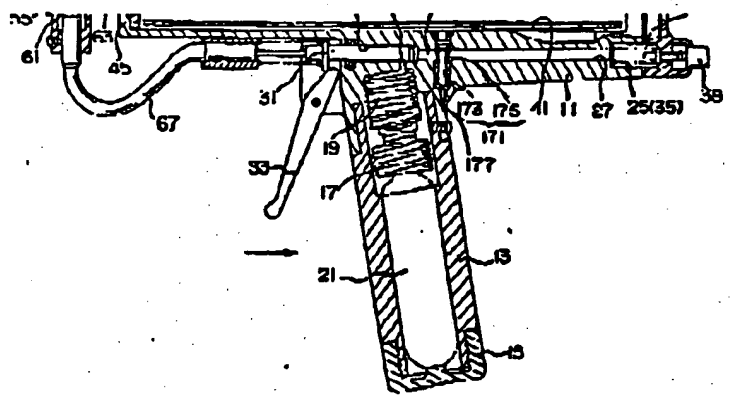
PATENTS ACT 1977

SPECIFICATION NO 2162902A

The following corrections were allowed under Section 117 on 16 May 1986

Front page Heading (71) Applicants
for Shizuoka-ken 436, Japan
read Shizuoka-ken, 439 Japan

THE PATENT OFFICE
27 May 1986



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(54) Viscous agent injecting instrument

(57) A viscous agent injecting instrument includes a gas chamber 43, a pressurized gas source 21, and a flow passage 27 connecting the pressurized gas source and the gas chamber through an open-and-shut valve 31 which is arranged to open to send a pressurized gas into the gas chamber to press a viscous agent filled cylinder P so that the viscous agent is injected therefrom. The viscous agent filled cylinder is provided at its discharge port with an injection control valve 55 for controlling the injection of the viscous agent, the injection control valve being associated with the open-and shut valve so that the former is opened only when the latter is opened. The valve 55 may be operated by a cable 87 (as shown) or by gas pressure (Fig. 2). A coat of elastic material can be provided at the rear of the cylinder P (Figs. 5, 7, 11), and a safety valve 171 can be included to allow venting of the gas chamber if the cylinder is removed

FIG. 3

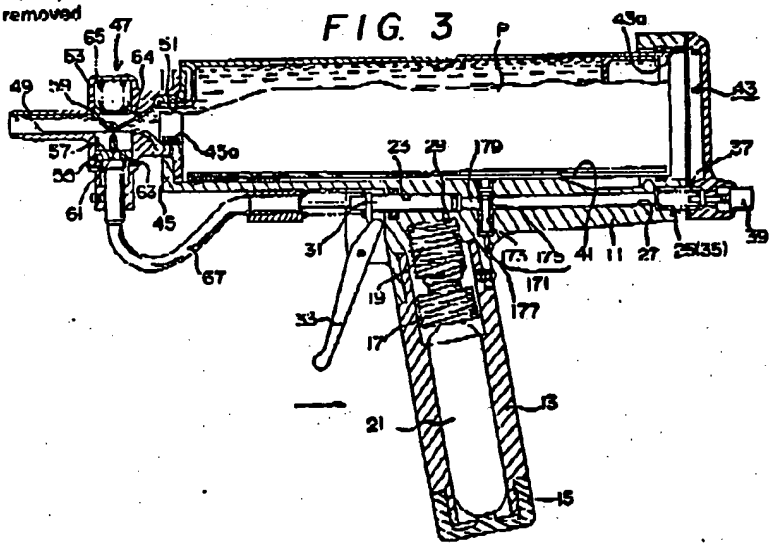

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FIG. 1

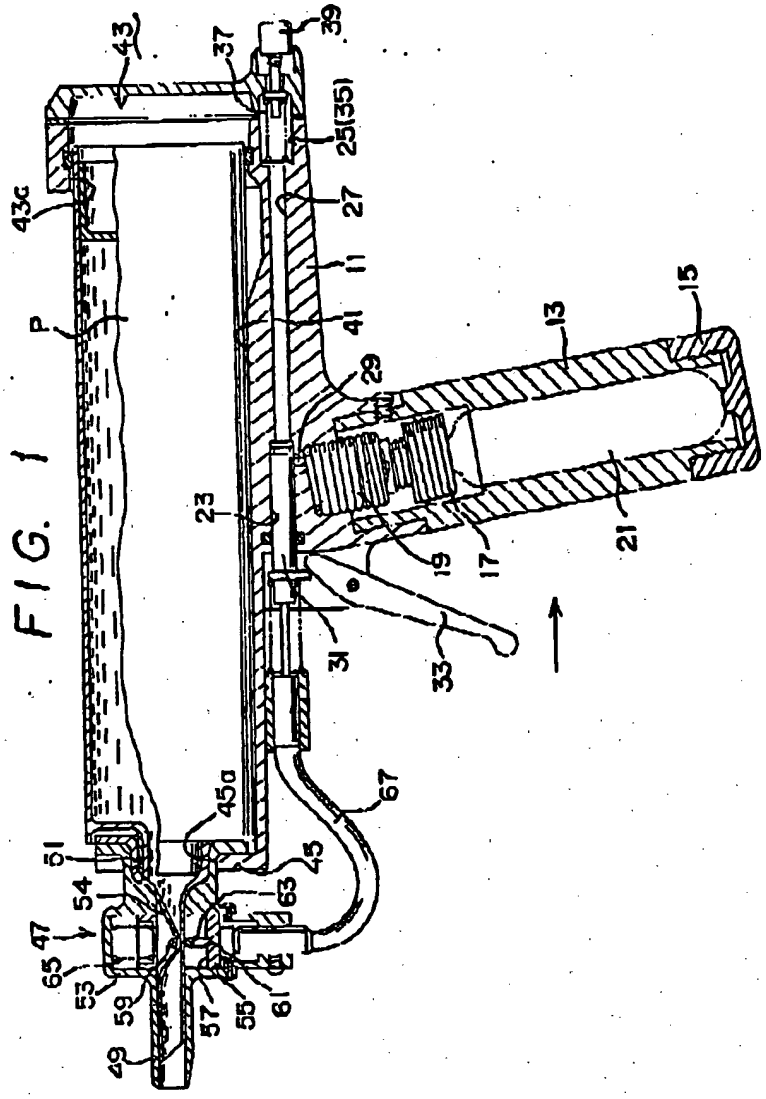
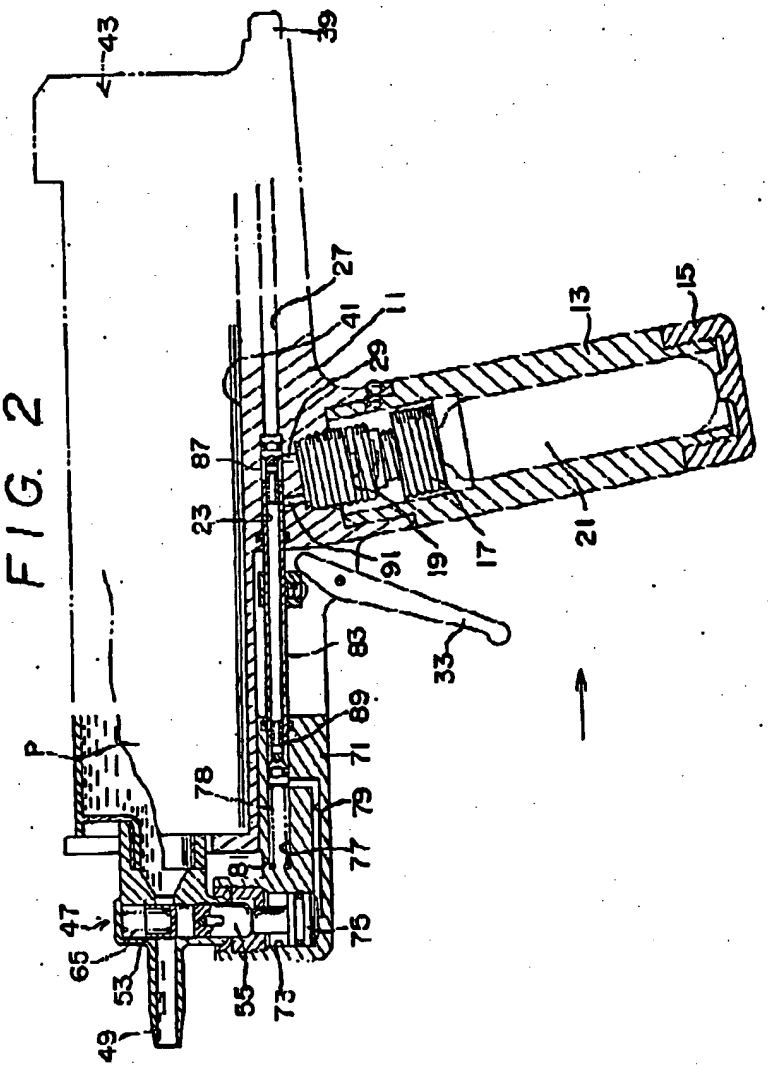


FIG. 2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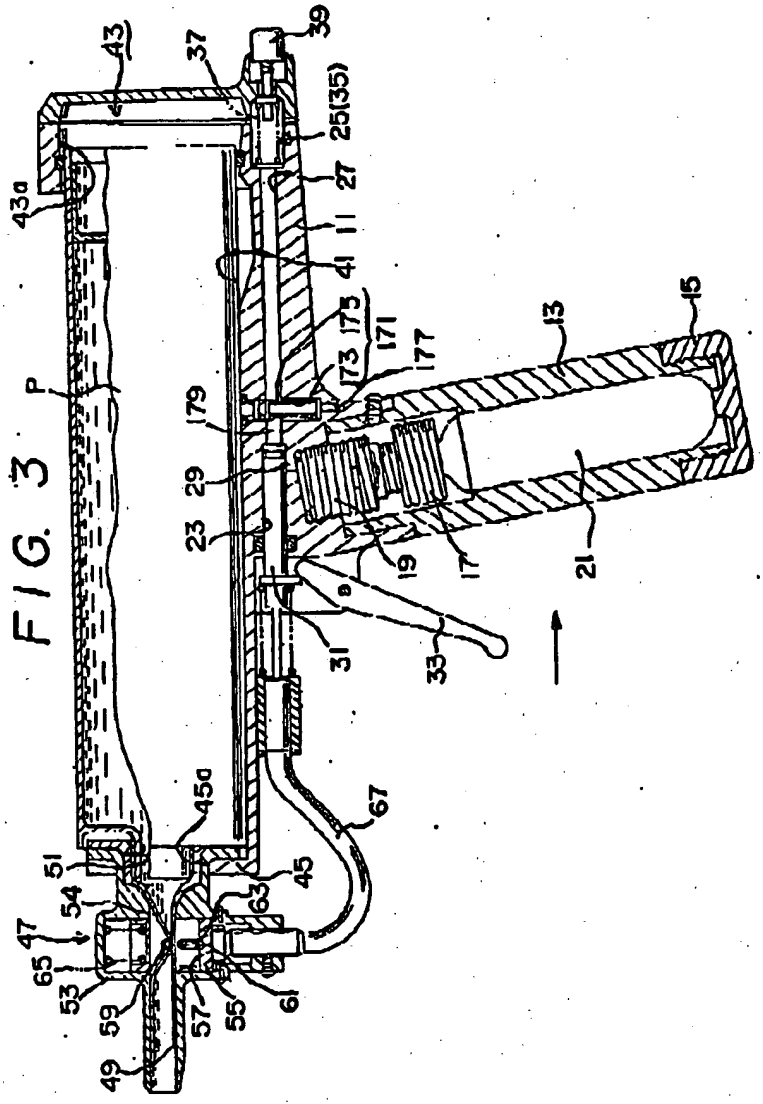

FIG. 3

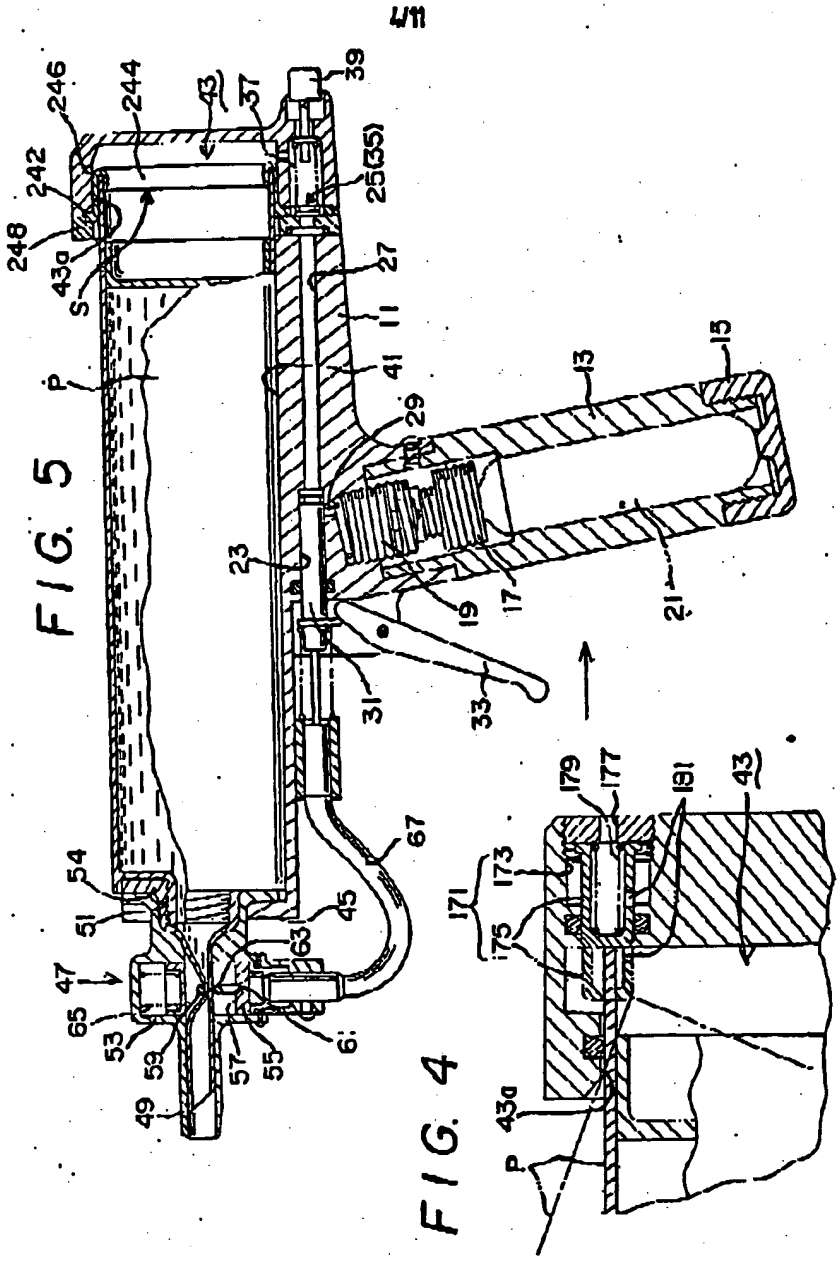
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FIG. 5

FIG. 4

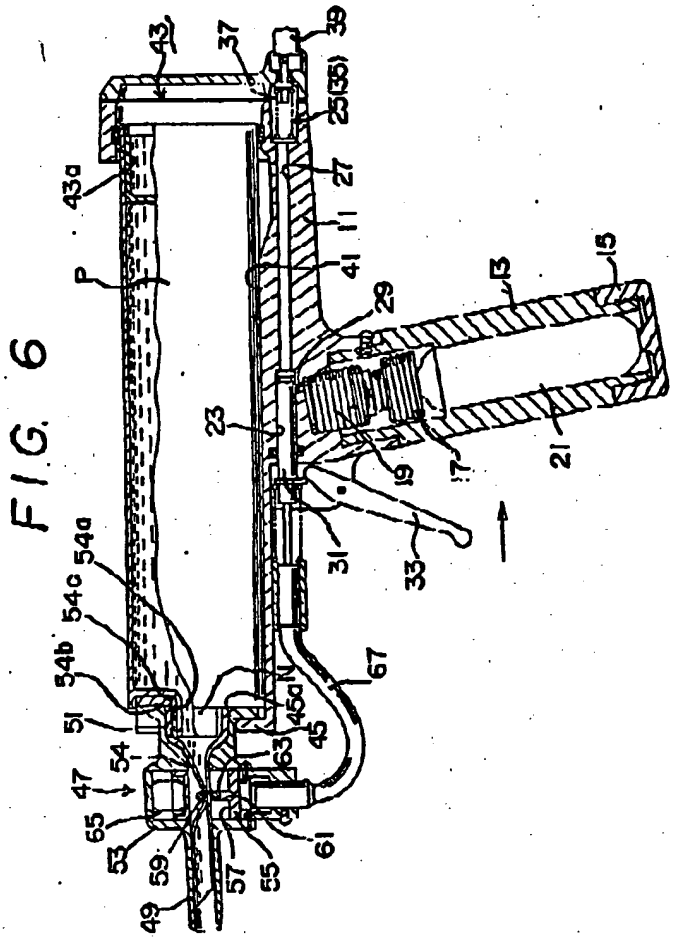
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FIG. 6

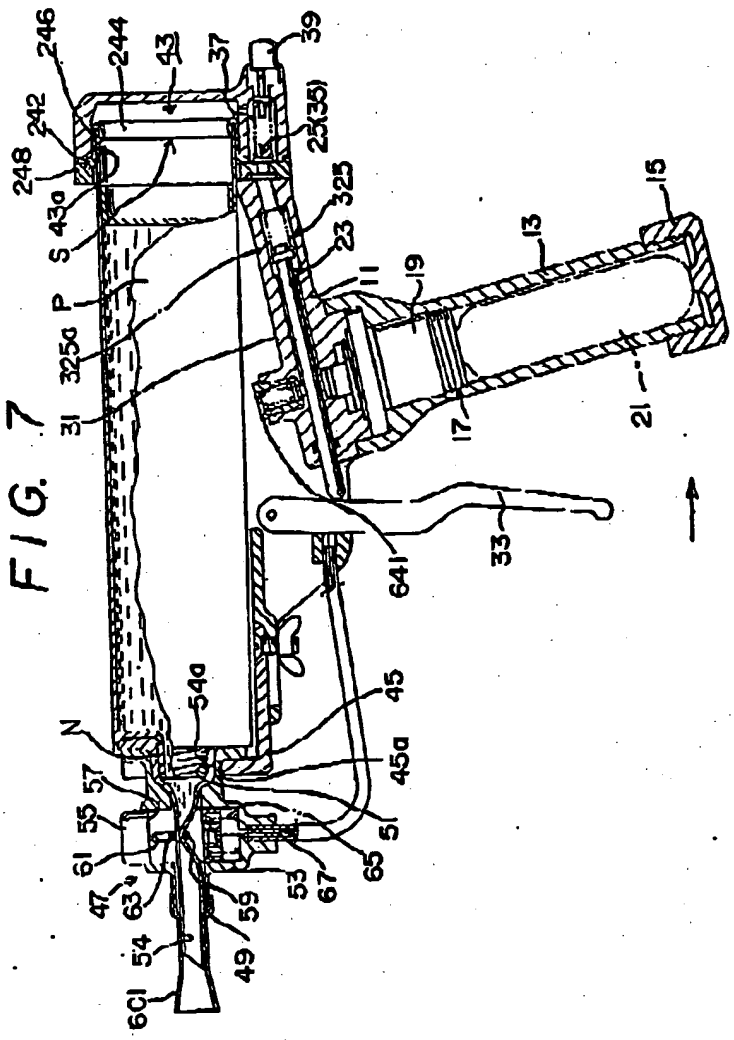
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FIG. 7

FIG. 8

FIG. 9

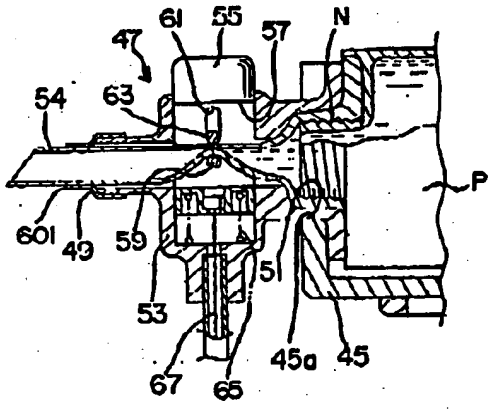
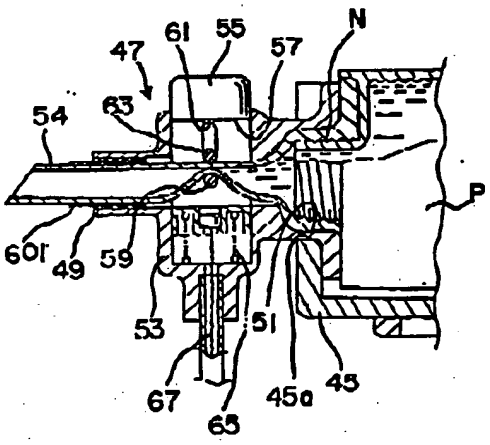


FIG. 10



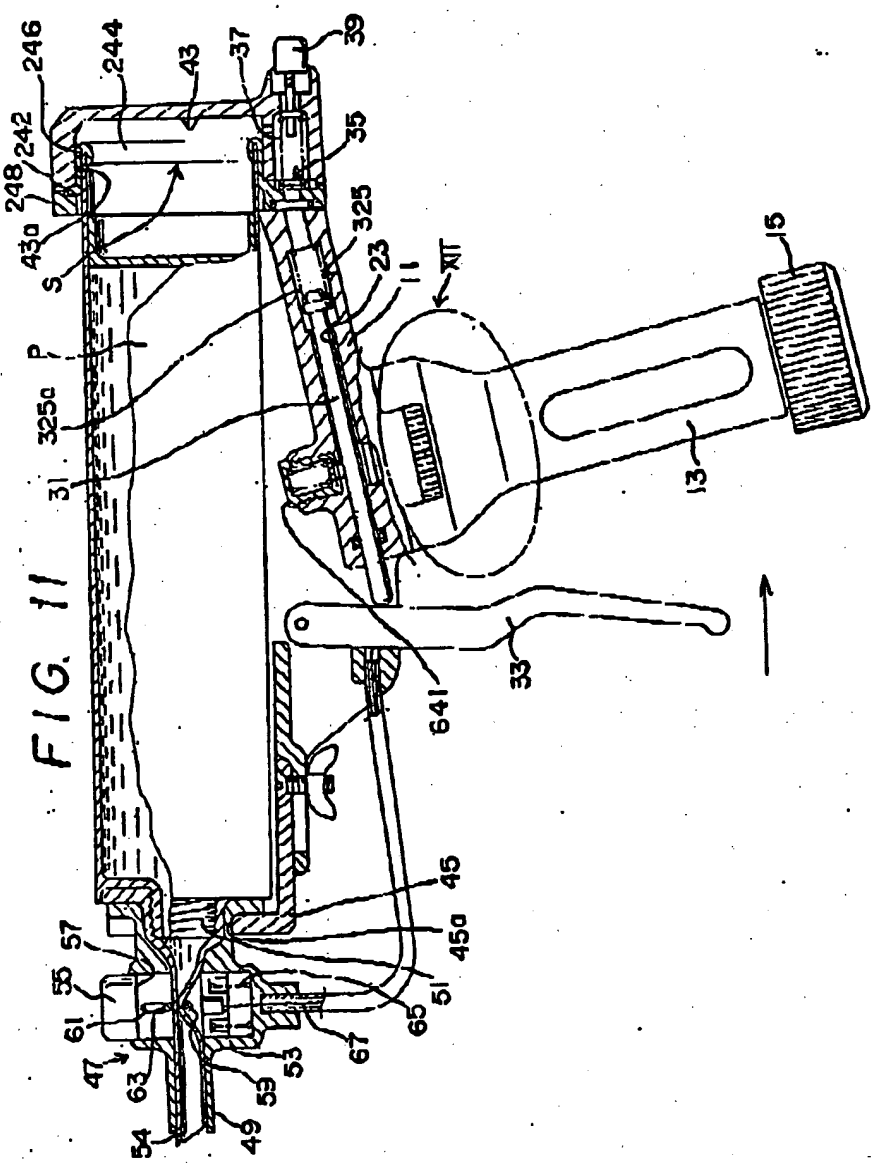

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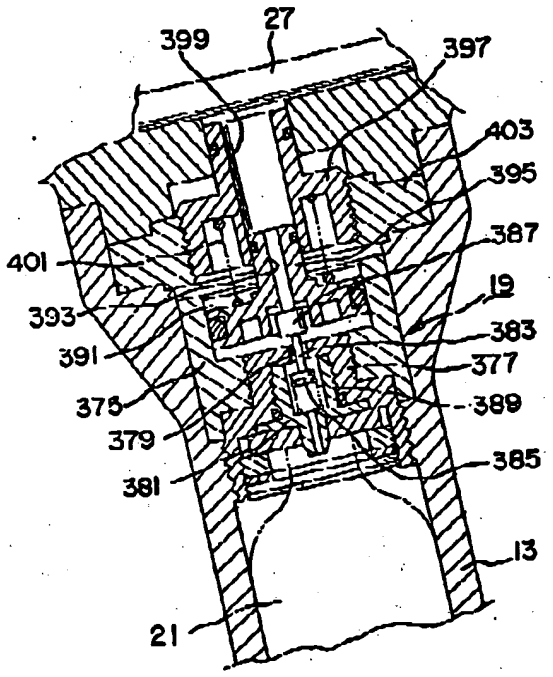
FIG. 11

FIG. 12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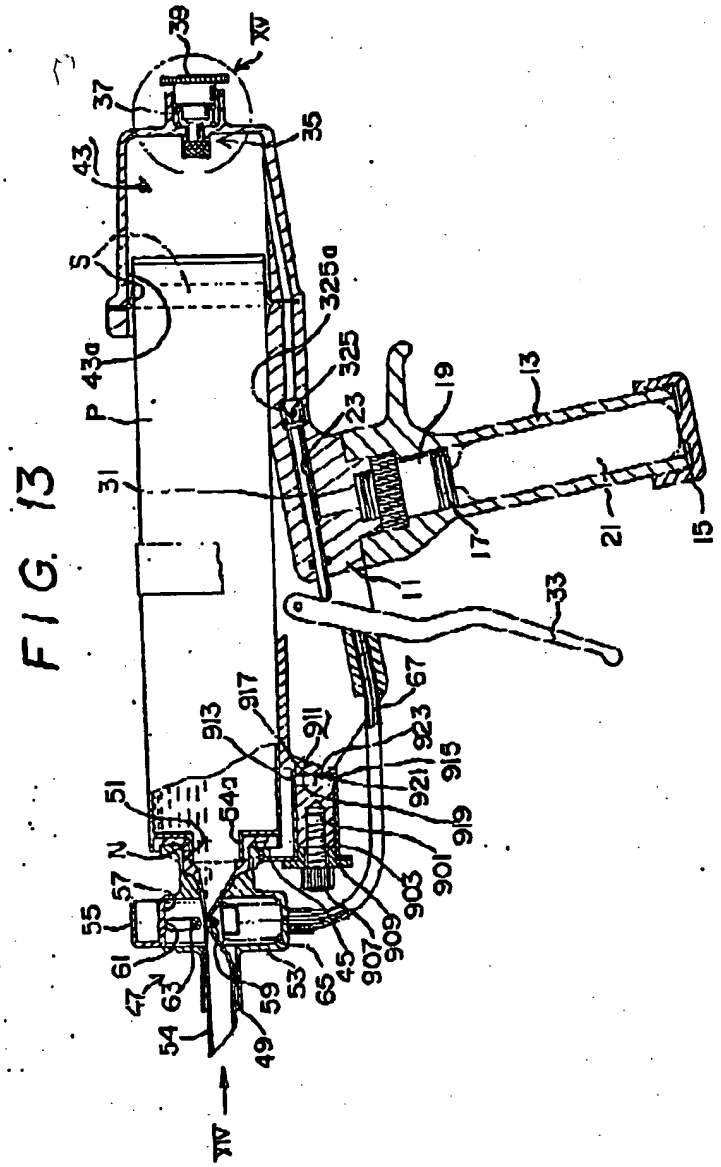
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XIV

FIG. 13

FIG. 15

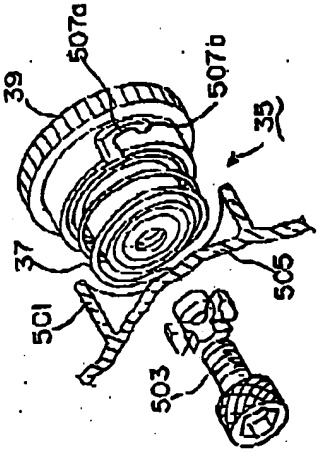


FIG. 17

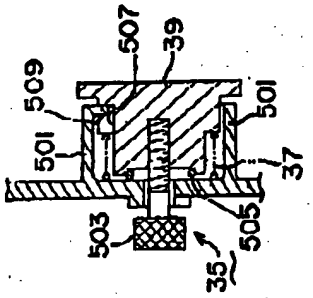


FIG. 14

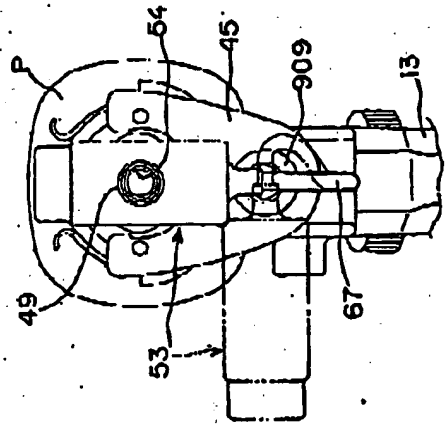
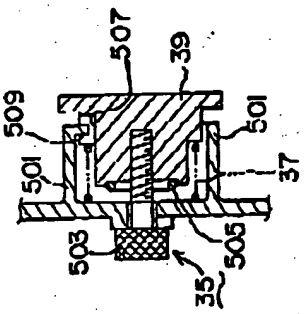


FIG. 16



SPECIFICATION

Viscous agent injecting instrument

BACKGROUND OF THE INVENTION

1. Field of the Invention

This invention relates to an injecting instrument for supplying a viscous agent such as a sealing agent etc. by a pressurized gas.

2. Description of the Prior Art

Generally, in an injecting instrument of this type for supplying a viscous agent by a pressurized gas, even if supply of the pressurized gas is stopped in order to stop the supply of a viscous agent, the viscous agent is kept injected, since the viscous agent filled container is kept pressurized by pressure remained in a gas chamber.

Because of the foregoing reason, it is a usual practice for a conventional injecting instrument of this type in which a pressurized gas is supplied by a compressor to degas the pressurized gas in order to prevent the viscous agent from kept injecting.

However, the conventional injecting instrument employing a pressurized gas cylinder has such a disadvantage as that a gas cylinder is required to replace frequently since the frequent degasing of the pressurized gas increases consumption of gas.

The present invention was accomplished in order to eliminate the above-mentioned problem inherent in the prior art instrument.

SUMMARY OF THE INVENTION

It is therefore a primary object of the present invention to provide a viscous agent injecting instrument, wherein a viscous agent, after supply of a pressurized gas is stopped, is not kept injected from a viscous agent filled cylinder without degasing.

In order to achieve the above object, there is essentially provided a viscous agent injecting instrument including a gas chamber, a pressurized gas source, a flow passage for connecting the pressurized gas source and the gas chamber through an open-and-shut valve which is such arranged as to open to send a pressurized gas into the gas chamber to press a viscous agent filled cylinder so that the viscous agent is injected therefrom, whereby an injecting control valve for controlling the injection of the viscous agent is mounted in an injection port of the viscous agent filled cylinder, the injection control valve being associated with the open-and-shut valve so that the former is opened only when the latter is opened.

Other objects and features of the present invention will become manifest to those skilled in the art from the following detailed description of preferred embodiments when read in connection with the accompanying drawings.

BRIEF DESCRIPTION OF THE INVENTION

In the drawings:

Fig. 1 is a sectional view of a viscous agent injecting instrument according to a first embodiment of the present invention;

Fig. 2 is likewise a sectional view of a second embodiment of the present invention;

Fig. 3 is likewise a sectional view of a third embodiment of the present invention;

Fig. 4 is a partial sectional view of a viscous agent injecting instrument according to a fourth embodiment of the present invention;

Fig. 5 is likewise a partial sectional view of a fifth embodiment of the present invention;

Fig. 6 is likewise a partial sectional view of a sixth embodiment of the present invention;

Fig. 7 is likewise a partial sectional view of a seventh embodiment of the present invention;

Fig. 8 is a perspective view of a cylindrical body used in the seventh embodiment of the present invention;

Fig. 9 is a sectional view of an essential part of the eighth embodiment of the present invention;

Fig. 10 is likewise a sectional view of an essential part of the ninth embodiment of the present invention;

Fig. 11 is a partial sectional view of the tenth embodiment of the present invention;

Fig. 12 is an enlarged sectional view of a part as shown by XII in Fig. 11;

Fig. 13 is a sectional view of the eleventh embodiment of the present invention;

Fig. 14 is likewise a sectional view of Fig. 13 when view from the direction as shown by an arrow XIV therein;

Fig. 15 is an exploded perspective view of a portion as shown by XV in Fig. 13;

Fig. 16 is an enlarged sectional view of the above (in an opened state); and

Fig. 17 is likewise an enlarged sectional view of the above (in a shut state).

DETAILED DESCRIPTION OF THE EMBODIMENTS

A first preferred embodiment of the present invention will be described with reference to the accompanying drawings with reference to Fig. 1

In the figure, reference numeral 11 denotes a basic portion, reference numeral 13 denotes a grip cylinder secured to the basic body 11 by screw-means, and reference numeral 15 denotes a screwed cap covering an opening formed in the grip cylinder 13.

Similarly, reference numeral 17 denotes an unsealing mechanism, and reference numeral 19 denotes a pressure reducing valve disposed within the grip cylinder 13. This unsealing mechanism 17 is adapted to unseal a carbon dioxide gas cylinder 21 contained in the grip cylinder 13. On the other hand, the pressure reducing valve 19 is adapted to

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gradually reduce the procedure of a pressurized carbon dioxide gas flowed out from the carbon dioxide gas cylinder 21.

Reference numeral 23 denotes a valve chest of a cylindrical shape formed in an upper part of the grip cylinder 13 in the basic body 11. This valve chest 23 is communicated with a gas chamber 43 as will be described through a flow passage 27 including a check valve 25, and also with a secondary side of the pressure reducing valve 19 through a communication hole 29. Reference numeral 31 denotes a valve rod reciprocally movably inserted into the valve chest 23. Reciprocal movement of the valve rod 31 by means of a control lever 33 causes the flow passage 27 to communicate with or discommunicate from the communication hole 29. The valve chest 23 and the valve rod 31 form an open-and-shut valve of the present invention. The check valve 25 is integrally formed with a discharge valve 35 and serves to degas the pressurized gas within a gas chamber 43 by pressing a knob 39 resisting a compression spring 37.

Nextly, reference numeral 41 denotes a cylinder insertion recess formed in an upper part of the basic body 11. This cylinder insertion recess 41 is adapted to insert a viscous agent filled cylinder P therein. Reference numeral 43 denotes a gas chamber formed in a rear part of the cylinder insertion recess 41. This gas chamber 43 has an opening 43a at its cylinder insertion recess 41 side. The inner periphery of the opening 43a serves as a fitting seat for fitting the viscous agent filled cylinder P thereto. The viscous agent filled cylinder P is tightly fit to the fitting seat so that the gas chamber 43 makes itself as a sealed space. On the other hand, reference numeral 45 denotes a receiving seat having a cut-out and integrally formed with the basic body 11 at the front side of the cylinder insertion recess 41. The receiving seat 45 is abutted with a front end portion of the viscous agent filled cylinder P inserted in the cylinder insertion recess 41.

Reference numeral 47 denotes an injection member having a nozzle 49 at its front end and a fitting opening 51 at its rear end. Fitted in the fitting opening 51 of the injection member 47 through an elastic tube 54 made of a rubber material is a front end of the viscous agent filled cylinder P. That is, a rear end portion of the elastic tube 54 corresponds to the seal member recited in claim 13, which is held depressed between an internal wall of the fitting opening 51 of the injection control valve 47 and a front end of an injection port of the viscous agent filled cylinder P, or between the internal wall of the fitting opening 51 and the outer periphery of the injection port of the viscous agent filled cylinder P. The injection member 47 is retained in the cut out 45a of the receiving seat 45, in the state that the viscous agent filled cylinder P is attached. Reference numeral 53 denotes a valve chest formed between the nozzle 49 of the injection member 47 and the fitting opening 51. This valve chest 53 is of a cylindrical shape and includes a valve body 55 of a rod shape for reciprocal movement within its inside. Reference 57 denotes a window formed at the valve body 55. Inserted in this window 57 is the elastic tube 54 fitted in the viscous agent filled cylinder P. Reference 59 denotes a moving pin which is bridged over the window 57. Accordingly, the moving pin 59 is moved up and down in accordance with the reciprocal movement of the valve body 55. Reference numeral 61 denotes an elongated slot formed in the valve body 55. The elongated slot 61 is adapted to permits fixed pin 63 bridged over the valve chest 53 to insert therein. Inserted between the fixed pin 63 and the moving pin 59 is the elastic tube 54. Reference numeral 65 denotes a compression spring for pressing the valve body 55 disposed within the valve chest 53 in the downward direction. Due to the foregoing, communication between the fixed pin 63 and the moving pin 59 is broken.

It is noted that the valve chest 53 and the valve body 55 correspond to the injection control valve of the present invention.

Nextly, reference 67 denotes a push-and-pull cable for connecting the valve body 55 and the valve rod 31 each other. As a result, if the valve rod 31 is slided in the leftward direction by the control lever 33, the valve body 55 is pushed in the upward direction resisting the force of the compression spring 65. On the other hand, if the control lever 33 is released, the valve body 55 is pressed in the downward direction by the biasing force of the compression spring 65. Accordingly, the valve rod 31 is slided in the rightward direction.

Operation of the first preferred embodiment will be described hereunder. If the control lever 33 is pulled in the direction of an arrow resisting the compression spring 65, the valve rod 31 is slided in the leftward direction. Then, the communication hole 29 and the flow passage 27 are communicated with each other to permit a pressurized carbon dioxide gas to flow into the gas chamber 43 to press the bottom surface of the viscous agent filled cylinder P. At the same time, the valve body 55 of the injection member 47 is pushed up through the push-and-pull cable 67. Accordingly the elastic tube 54 resumes its communication. As a result, the viscous agent of the viscous agent filled cylinder P is injected from the nozzle 49.

If the pulling of the control lever 33 is released, the injection of the viscous agent is stopped. Then the valve body 55 is pressed in the downward direction by the biasing force of the compression spring 65. Accordingly,

communication of the elastic tube 54 is broken again by the moving pin 59 and the fixed pin 63. At the same time, the valve rod 31 is slided in the rightward direction through the push-and-pull cable 67 to break the communication between the communication hole 29 and the flow passage 27. As a result, supply of the pressurized carbon dioxide gas into the gas chamber 43 is stopped.

Referring now to Fig. 2, a second preferred embodiment of the present invention will be described hereunder. According to the second embodiment, an injection control valve is opened by means of a pressurized carbon dioxide gas too.

In Fig. 2, reference numeral 71 denotes a supporting member firmly secured to a basic portion 11. This supporting member 71 has a cylinder portion 73. Reference numeral 75 denotes a piston to be inserting into the cylinder portion 73 in order to move a valve body 55 up and down. Reference numeral 77 denotes a deep hole including a return spring 78. The deep hole 77 is formed in the supporting member 71. This deep hole 77 is communicated with the cylinder portion 73 by a flow passage 79 and includes a through-hole 81 at its bottom portion. Reference numeral 83 denotes a tube valve, both ends of which are reciprocally movably inserted in the deep hole 77 and the valve chest 23 respectively. The tube valve 83 has openings 87 and 89 each at its both ends. One of the openings 87 is communicated with a secondary side of the pressure reducing valve 19 through the communication hole 91. On the other hand, the other opening 89 is communicated with the flow passage 79. Reference numeral 70 denotes a return spring of the tube valve 83. The elastic tube 54 which is employed in the first embodiment is not employed in this second embodiment.

Accordingly, if the control lever 33 is pulled in the direction of an arrow resisting the return spring 70, the tube valve 83 is slided in the leftward direction. Then, the communication hole 29 and the flow passage 27 are communicated with each other, and at the same time, the communication hole 91 is communicated with the opening 87 of the tube valve 83, and the flow passage 79 is communicated with the other opening 89. As a result, the pressurized carbon dioxide gas is flowed into the gas chamber 43 to press the bottom surface of the viscous agent filled cylinder P. At the same time, the piston 75 is caused to push up the valve body 55 of the injection member 47 resisting the compression spring 65 to open the valve body 55. As a result, the viscous agent within the viscous agent filled cylinder P is injected from the nozzle 49.

If the pulling of the control lever 33 is released, the injection of the viscous agent is stopped. As a result, the tube valve 83 is slided in the rightward direction due to the biasing force of the return spring 78. Accordingly, communications between the communication hole 29 and the flow passage 27, between the communication hole 91 and the opening 87 of the tube valve 83, and between the flow passage 79 and the other opening 89 are all broken. At the same time, the inside of the cylinder portion 73 is communicated with the atmosphere through the flow passage 79, the deep hole 77 and the through-hole 81. As a result, the viscous agent filled cylinder is not pressurized thereafter, and the valve body 55 is shut by the compression spring 65.

Referring to Fig. 3, a third preferred embodiment of the present invention will be described hereunder. In the figure, reference numeral 171 denotes a safety valve disposed in the mid-way of the flow passage 27 of the basic portion 11. The safety valve 171 comprises a valve chest 173 defined in the basic portion 11 and a valve body 175 reciprocally movably inserted therein. Reference numeral 177 denotes an open passage communicating with the valve chest 173. Reference numeral 179 denotes a compression spring which causes the front end of the valve body 175 to abut against a side surface of the viscous agent filled cylinder P at the cylinder inserting recess 41. The safety valve 171 shown in the figure is shut. If the viscous agent filled cylinder P is removed from the cylinder inserting recess 41, the valve body 175 is projected outwardly. As a result, the flow passage 27 is caused to communicate with the open passage 177 to release the pressurized gas in the atmosphere.

Referring now to Fig. 4, a fourth preferred embodiment of the present invention will be described. In the figure, the safety valve 171 is provided on the rear wall of the gas chamber 43. In this safety valve 171, when the viscous agent filled cylinder P is removed from the cylinder inserting recess 41, the valve body 175 is projected inward the inside of the gas chamber 43. As a result, the gas chamber 43 is caused to communicate with the atmosphere through the through-hole 181 and the open passage 177. As a result, the pressurized gas is released in the atmosphere.

Referring to Fig. 5, a fifth preferred embodiment of the present invention will be described. In the figure, inserted into the opening 43a is the rear portion of the viscous agent filled cylinder P through a seal member S. The seal member S is formed of an elastic material such as a rubber etc., and comprises a cylindrical member 246 including at its front end an outer flange 242, and at its rear end periphery an inwardly warped piece 244 integrally formed therewith. And, this seal member S is tightly fixed, with the outer flange 242 held by a frame member 248 at the inner periphery of the opening 43a with

its cylindrical member 246 fitted between the opening 43a of the gas chamber 43 and the viscous agent filled cylinder P, and at the same time, the rear end periphery of the viscous agent filled cylinder P is held by and between the cylindrical body 246 and the inwardly warped piece 244.

Referring to Fig. 6, a sixth preferred embodiment of the present invention will be described hereunder. In the elastic tube 54, reference numeral 54b is a peripheral groove, which is formed in an inner wall surface of an end marginal portion of its fitting opening 54a. This peripheral groove 54b is formed in a V-shape in section, one end of which forms a gradually reduced piece 54c. Due to the foregoing, when the viscous agent injected from an injection nozzle N of the viscous agent filled cylinder P enters in the peripheral groove 54b, the peripheral groove 54b tends to widen the groove width. Accordingly, an end periphery (the fitting opening 54a side) of the elastic tube 54 is brought to be in pressure contact with the viscous agent filled cylinder P.

Referring to Fig. 7, a seventh preferred embodiment of the present invention will be described hereunder. In the figure, reference numeral 47 denotes an injection control valve which includes a nozzle 49 at its front end and a fitting opening 51 at its rear end. Fitted in this fitting opening 51 of the injection control valve 47 is an injection nozzle N of the viscous agent filled cylinder P through an elastic tube 54 made of a rubber material (fitted in the injection nozzle N through the fitting opening 54a). And, the injection control valve 47 is retained in the receiving seat 45 in the state that the viscous agent filled cylinder P is attached. Reference numeral 53 denotes a valve chest formed between the nozzle 49 of the injection control valve 47 and the fitting opening 51. This valve chest 53 is of a cylindrical shape. The valve chest 53 includes at its inside a reciprocally movable valve body 55 of a rod shape. Reference numeral 57 denotes a window which is formed in the valve body 55. Inserted in the window 57 is the elastic tube 54 fitted in the viscous agent filled cylinder P. Reference numeral 59 denotes a moving pin bridged over the window 57. The moving pin 59 is moved up and down in accordance with the reciprocal movement of the valve body 55. Similarly, reference numeral 61 denotes an elongated slot formed in the valve body 55. This elongated slot 61 is adapted to permit the fixed pin 63 bridged over the valve chest 53 to insert therein. Inserted between the fixed pin 63 and the moving pin 59 is the elastic tube 54. Reference numeral 65 denotes a compression spring disposed within the valve chest 53 to press the valve body 55 in the upward direction. As a result, the communication of the elastic tube 54 between the fixed pin 63 and the moving pin 59 is normally broken.

Reference numeral 601 denotes a cylindrical member made of a synthetic resin material having a heat contracting property which is tightly fitted in around the elastic tube 54 exposed from the nozzle 49. The cylindrical member 601 has a rigid property and is extended as far as the outer wall surface of the nozzle 49. Accordingly, the elastic tube 54 is not flabby with respect to the nozzle 49. The cylindrical member 601 is suitably changed in its shape by heating. Accordingly, the elastic tube 54 can be suitably changed in its shape by applying a viscous agent at suitable places. The elastic tube 54 is formed flat at its front end with its diameter enlarged as shown in Fig. 8. Reference numeral 641 denotes a safety valve disposed at an upper portion of the valve chest 23 in the basic body 11. This safety valve 641 is adapted to prevent the gas pressure within the valve chest 23 from becoming unnecessarily large. Alternatively, the cylindrical member 601 may be formed of a rubber material having a heat contracting property.

Nextly, eighth and ninth preferred embodiments will be described hereunder. Fig. 9 denotes the eighth preferred embodiment, in which the front end of the elastic tube 54 is projected from the cylindrical member 601 which is fitted onto the nozzle 49. Fig. 10 illustrates the ninth preferred embodiment of the present invention, in which the front end of the elastic tube 54 is projected from the cylindrical member 601 which is fitted into the nozzle 49.

Referring now to Figs. 11 and 12, a tenth preferred embodiment of the present invention will be described hereunder. In Fig. 11, reference numeral 325 denotes an open-and-shut valve formed in the mid-way of the valve chest 23. This open-and-shut valve 325 is adapted to control the pressurized gas supplied into a gas chamber 43 as will be described. Reference 31 denotes a valve rod constituting the open-and-shut valve 325 which is reciprocally movably inserted in the valve chest 23 with its front end exposed. The valve rod 31 is reciprocally moved in accordance with the oscillation of the control lever 33 to open and shut the open-and-shut valve 325. Similarly, reference numeral 65 denotes a compression spring disposed within the valve chest 53 to press the valve body 55 in the upward direction. Accordingly, communication of the elastic tube 54 between the fixed pin 63 and the moving pin 59 is normally broken.

Reference numeral 67 denotes a push-and-pull cable having a flexible property, which is adapted to connect the valve body 55 and the control lever 33 each other. Accordingly, if the valve rod 31 is slided in the rightward direction (the direction of an arrow, see Fig.

11) by means of the control lever 33, the valve body 55 is pulled in the downward direction resisting the compression spring 65. On the contrary, if the control lever 33 is released, the communication of the elastic tube 61 is broken, since the valve body 55 is pushed in the upward direction by the biasing force of the compression spring 65. At this time, the valve rod 31 is slided in the leftward direction by the compression spring (return spring) of the open-and-shut valve 325.

In Fig. 12, reference numeral 375 denotes a cylinder member fixed within the grip cylinder 13. This cylinder member 375 has a partition member 377 threaded into its lower part. Reference numeral 379 denotes a through-hole formed in the partition member 377. The through-hole 379 is adapted to permit spaces at both sides of the partition member 377 to communicate each other.

Reference numeral 381 denotes a seal member threaded in the partition member 377. The seal member 381 unseals the carbon dioxide gas cylinder 21 at its projecting end.

Reference numeral 383 denotes a rod member loosely fitted into the through-hole 379 of the partition member 377. One end of the rod member 383 is contacted to the valve body 385, while the other end thereof is provided with a supporting body 387. The valve body 385 is located within the seal member 381 and causes the through-hole 379 to shut by means of the biasing force of the compression spring 389. On the other hand, the supporting body 387 is located within the cylinder member 375 and is in pressure contact with a piston member 391 as will be described hereinafter.

Reference numeral 391 denotes a piston member reciprocally movably inserted in an upper portion of the cylinder member 375. This piston member 391 has a shaft member 395 including an axial hole 393. Similarly, reference numeral 397 denotes a supporting member having a through-hole 399 unrotatably disposed, with the shaft member 395 of the piston member 391 reciprocally movably inserted in the through-hole 399. The supporting member 397 has a male thread portion at its outer periphery, and is adapted to support a compression spring 401 (having stronger biasing force than that of the compression spring 389) bridged over to the piston member 391. Reference numeral 403 denotes an adjusting nut member secured to the outer periphery of the supporting member 397. Accordingly, when the adjusting nut member 403 is turned, the supporting member 397 is caused to move up and down to adjust the strength of the biasing force of the compression spring 401.

It is noted that the cylinder member 375, the piston member 391, the partition member 377, the rod member 383, the valve body 385, the supporting body 387, the supporting member 397, and the adjusting nut 403 correspond to the pressure reducing means recited in claim 14.

Since the adjusting nut member 403 is partially exposed from the grip cylinder 13, it can be adjusted from outside of the grip cylinder 13 (see Fig. 11).

Operation of the tenth preferred embodiment will be described. Firstly, the adjusting nut member 403 is turned to suitably determine the biasing force of the compression spring 401 . In this state (as shown in Fig. 12), the high pressure gas of the carbon dioxide gas cylinder 21 is unsealed. The high pressure gas is caused to enter into the inside of the cylinder member 375 after passing through the through-hole 379 to increase the gas pressure within the cylinder member 375. When the gas pressure within the cylinder member 375 becomes higher than the predetermined pressure, the piston member 391 is moved upwardly resisting the force of the compression spring 401. As a result, the rod member 383 is pressed upwardly by the biasing force of the compression spring 389 to have the valve body 385 shut the through-hole 379. As a result, the pressurized gas within the cylinder member 375 is gradually flowed toward the gas chamber 43.

When the internal gas pressure becomes lower than a predetermined value after the pressurized gas within the cylinder member 375 is flowed out passing through the axial hole 393 of the piston member 391, the piston member 391 is moved downward by means of the biasing force of the compression spring 401. When the piston member 391 is moved downward, the rod member 383 is pressed in the downward direction (it is noted that the biasing force of the compression spring 401 is larger than that of the compression spring 389). As a result, the valve body 385 is lowered to open the through-hole 379. As a result, the high pressure gas is flowed into the inside of the cylinder member 375 again.

By repeating the above mentioned cycle, the gas chamber 43 is gradually reduced in gas pressure, thereby enabling to supply a pressurized gas suitable to the viscous agent.

An eleventh preferred embodiment of the present invention will be described. In Fig. 13, reference numeral 35 denotes a discharge valve located at the rear wall of a gas chamber 43 as will be described later. This discharge valve 35 will be described with reference to Figs. 15, 16 and 17. In these figures, reference numeral 501 denotes a cover cylindrical member erected on the outer wall surface of the gas chamber 43. Reference numeral 39 denotes a knob reciprocally movably fitted in the cover cylindrical member 501. The knob 39 is secured by means of a fixing bolt 503 bolted from inside of the gas

chamber 43. Reference numeral 505 denotes a seal member of an annular shape located at the front end surface (the outer wall surface side of the gas chamber 43) of the knob 39.

Reference numeral 507 denotes a retaining groove of a right-angled shape formed in the side wall surface of the knob 39. This retaining groove 507 is adapted to permit a retaining projection 509 of the cover cylindrical member 501 to reciprocally move therealong. Reference numeral 37 denotes a compression spring bridged over between the outer wall surface of the gas chamber 43 and the knob 39.

The discharge valve 35 having the above mentioned construction is normally opened, since the seal member 505 is kept away from the outer wall surface of the gas chamber 43 due to the biasing force of the compression spring 37. On the other hand, the discharge valve 35 is shut by pressing the knob 39 resisting the force of the compression spring 37 to bring the seal member 505 in pressure contact with the outer wall surface of the gas chamber 43. When, in the foregoing state, the knob 39 is turned in the rightward direction to fit the retaining projection 509 into an angled portion 507a of the retaining groove 507 and further into the recess 507b, the shutting state of the discharge valve 35 is fixedly maintained.

Nextly, reference numeral 43 denotes a gas chamber formed at a rear part of the basic body 11. This gas chamber has an opening 43a, into which a rear portion of the viscous agent filled cylinder P is inserted through the seal member S. The seal member S is formed of an elastic material such as a rubber etc. The viscous agent filled cylinder P is air tight and slidably movable with respect to the seal member S.

On the other hand, reference numeral 901 denotes a shaft portion integrally formed with the front end of the basic portion 11. Reference numeral 903 denotes a revolving cylinder revolvably inserted in the shaft portion 901. Similarly, reference numeral 45 denotes a receiving seat fixed to the end periphery of the revolving cylinder 903. The receiving seat 45 is swingable around the shaft portion 901. Reference numeral 907 denotes a fixing screw adapted to fix the front end surface of the shaft portion through a bush 909 in order to prevent the revolving cylinder 903 to come off. Reference numeral 911 denotes a click-stop mechanism comprising small holes 913, 913 of the revolving cylinder 903 and a small ball 919 biased outwardly (by means of the compression spring 917) in a through-hole 915 of the shaft member 901. The small hole 913 is formed in two locations spaced apart at 90° distance in the revolving direction so that the receiving seat 45 can fixedly maintain the vertical direction as well as the horizontal direction. Reference numeral 921 denotes an elongated slot of the revolving cylinder 903 which has a long diameter in the range of 90° in the revolving direction. Inserted in the elongated slot 921 is a head portion of a spring pin 923 for preventing the compression spring 917 from coming off, which also serves to prevent the revolving cylinder 903 from unnecessarily revolving.

Operation of the eleventh preferred embodiment will be described.

The rear portion of the viscous agent filled cylinder P is inserted in the opening 43a of the gas chamber 43 through the seal member S, with the receiving seat 45 positioned in the horizontal direction (the state shown by the virtual line in Fig. 14). Preferably, the discharge valve 35 is opened at this time.

After the viscous agent filled cylinder P is inserted, its inserting amount into the opening 43a is suitably adjusted so that the front end of the cylinder P is brought to be in the vicinity of the receiving seat 45. Thereafter, the injection control valve 47 is fitted in the injection nozzle N of the viscous agent filled cylinder P, with the receiving seat 45 positioned in the vertical direction (the state as shown by the solid line in Figs. 13 and 14). At this time, the rear portion of the viscous agent filled cylinder P is moved forwardly from the opening 43a. Then, the knob 39 of the discharge valve 35 is pressed and at the same time, is turned to lock the discharge valve 35 in its shut state. Thereafter, the control lever 33 is operated in the manner as described.

Nextly, the effects of the present invention will be described.

The viscous agent injecting instrument according to the present invention includes a gas chamber for inserting a viscous agent filled cylinder therein, a pressurized gas source, and a flow passage connecting the pressurized gas source and the gas chamber through an open-and-shut valve, the pressurized gas being sent into the gas chamber by opening the open-and-shut valve to press the viscous agent filled cylinder inserted in the gas chamber to inject a viscous agent, whereby an injection control valve for controlling the injection of the viscous agent is mounted in an injection port of the viscous agent filled cylinder, the injection control valve being associated with the open-and-shut valve so that the former is opened only when the latter is opened.

That is, according to this viscous agent injecting instrument, supply of the pressurized gas is stopped at the time when the injection of the viscous agent is stopped, and at the same time, the injection control valve mounted in the filling port of the viscous agent filled cylinder is shut. Accordingly, even if the viscous agent filled cylinder is pressed by a remaining pressure, the viscous agent is not injected from the filling port of the viscous

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agent filled cylinder.

Accordingly, no degasing is required as in the case with conventional injecting instruments, which results in good saving of gas.

Furthermore, the gas chamber has an opening, into which the viscous agent filled cylinder is inserted through a seal member made of an elastic material. The seal member comprises a cylindrical member having an outer flange at its front end and an inwardly warped piece integrally formed together at its rear end periphery. The seal member, with its cylindrical member inserted between the opening of the gas chamber and the viscous agent filled cylinder, is tightly fixed at its outer flange to the inner periphery of the gas chamber and at the same time, the rear end periphery of the viscous agent filled cylinder is held by and between the cylindrical member and the inwardly warped piece. Accordingly, even if the inserting portion of the rear end of the viscous agent filled cylinder is deformed and the outer periphery of the inserting portion is formed unevenly, it can be tightly inserted into the opening of the gas chamber.

Furthermore, the inwardly warped piece of the seal member is made of an elastic material and warped inwardly of the lower end periphery of the viscous agent filled cylinder. Due to the foregoing construction, the more the pressure within the gas chamber is increased, the more the inwardly warped piece is tightly attached to the inner side of the lower end periphery of the filled cylinder. Thus, air tight property of the seal member is further improved.

Furthermore, the instrument of the present invention employs a safety valve for degasing the pressurized gas from the passage of the gas chamber. The safety valve is arranged as such that it is shut at the time when the viscous agent filled cylinder is inserted in the gas chamber and opened at the time when the viscous agent filled cylinder is removed from the gas chamber.

That is to say, this instrument includes a safety valve for degasing a pressurized gas within a pressurized gas chamber. This safety valve is actuated at the time when the viscous agent filled cylinder is removed from the pressurized gas chamber. Accordingly, the viscous agent filled cylinder can be safely removed without any special operation for degasing.

Furthermore, an elastic tube for permitting the viscous agent to pass therethrough is inserted within the injection control valve so that the elastic tube is opened and shut in accordance with the opening and shutting action of the injection control valve. In conventional instruments, since the viscous agent is passed through an injection control valve, the injection control valve is tended to choke with the viscous agent. However, contrary to conventional instruments, even if the injection control valve is choked, the choking is solved by merely replacing the elastic tube since the viscous agent is choked in the elastic tube according to the present invention. Thus, easy handling of the injection control valve is obtained.

Furthermore, in a viscous agent injecting instrument wherein the elastic tube includes a fitting opening, through which it is fitted to the injection port of the viscous agent filled cylinder, an inner wall surface of the end periphery of the fitting opening of the elastic tube is formed with a peripheral groove. Due to the foregoing construction, even if the outer diameter of the injection nozzle of the viscous agent filled cylinder is smaller than the inner diameter of the fitting opening of the elastic tube, the viscous agent injected from the injection nozzle of the viscous agent filled cylinder enters in the peripheral groove to enlarge the groove width thereof. As a result, the end periphery (the fitting opening side) of the elastic tube is brought to be in pressure contact with the viscous agent filled cylinder. Thus, no gap is created between the elastic tube and the viscous agent filing cylinder, thereby obtaining complete sealing.

Moreover, since the peripheral groove is formed in a Vshape, a smooth tapered portion is formed at one end of the peripheral groove. Accordingly, intimate contact between the elastic tube and the viscous agent filled cylinder is further improved, thereby obtaining further improved sealing effect.

Furthermore, in a viscous agent filled instrument wherein the front end of the elastic tube is projected from the nozzle of the injection control valve, the elastic tube being covered with a heat contracting sheet having a rigid property from its front end to the injection control valve. Accordingly, in spite of that the elastic tube is formed of a soft elastic material, the shape of the front end thereof is always kept constant. As a result, easy positioning for applying the viscous agent is obtained at the time when the viscous agent is filled.

Moreover, the shape of the front end portion of the elastic tube can be suitably changed in accordance with its purposes.

Moreover, since the heat contracting sheet is of a cylindrical member, it is tightly fitted onto the elastic tube by heating. Thus, easy fitting of a heat contracting sheet is obtained.

Furthermore, if the heat contracting sheet is fitted into the injection control valve, the end portion of the nozzle side of the sheet is included within the nozzle. Thus, no interference of work is taken place.

Furthermore, if the heat contracting sheet is fitted onto the injection control valve, no dust, etc. enters into the nozzle. As a result, possible trouble of the injection control valve by dust, etc. can be prevented.

Furthermore, if a valve casing of the injection control valve is fitted to the injection port

of the viscous agent filled cylinder through an elastic seal member, even if the shape of the injection port of the viscous agent filled cylinder is not constant, e.g., even if the outer peripheral surface of the injection port is formed with thread, or even if the injection port is deformed, it can be intimately contacted to the injection control valve.

Furthermore, if pressure reducing means is provided between the pressurized gas source and the gas chamber and the pressure reducing rate of the pressure reducing means is made adjustable, viscous agent of any viscosity can be efficiently injected.

Furthermore, in a viscous agent injecting instrument as claimed in claim 1 including a basic body, a gas chamber having an opening and a receiving seat and provided at a rear portion of the basic body with the opening facing forward, the receiving seat being provided at a front portion of the basic portion, the receiving seat being provided with an injection control valve, a viscous agent filled cylinder being inserted at its rear portion in the opening of the gas chamber, an injection nozzle at its front portion being connected to the injection control valve, if a seal member is provided at the periphery of the opening of the gas chamber, the viscous agent filled cylinder being slidingly movable while maintaining an air-tight state of the viscous agent filled cylinder with respect to the seal member and at the same time, the receiving seat being pivotable around an axis of the back and forth direction of the basic portion with respect to the basic portion, the receiving seat is oscillated in either right or left direction from its normal position (the position for receiving the viscous agent filled cylinder) to enter the rear portion of the viscous agent filled cylinder into the opening of the gas chamber under pressure. At this time, since the viscous agent filled cylinder is slidable with respect to the opening of the gas chamber, a suitable position can be selected so that the front end portion thereof is brought to be in the position of the receiving seat.

Accordingly, contrary to conventional instruments, the receiving seat is not required to move by turning an adjusting screw after the rear portion of the viscous agent filled cylinder is inserted in the opening of the gas chamber. Thus, simple construction is obtained and easy mounting of the viscous agent filled cylinder is obtained.

From the foregoing it will be seen that a novel and efficient viscous agent injecting instrument has been described herein. The descriptive and illustrative materials employed herein are utilized for purposes of exemplifying the invention and not in limitation thereof. Accordingly, numerous modifications of the present invention will occur to those skilled in the art without departing from the spirit and scope of the present invention.

CLAIMS

1. A viscous agent injecting instrument including a gas chamber for inserting a viscous agent filled cylinder therein, a pressurized gas source, and a flow passage connecting said pressurized gas source and said gas chamber through an open-and-shut valve, the pressurized gas being sent into said gas chamber by opening said open-end-shut valve to press the viscous agent filled cylinder inserted in said gas chamber to inject a viscous agent, whereby an injection control valve for controlling injection of the viscous agent is mounted in an injection port of the viscous agent filled cylinder, said injection control valve being associated with said open-and-shut valve so that the former is opened only when the latter is opened.

2. A viscous agent injecting instrument according to claim 1, wherein said gas chamber has an opening, into which the viscous agent filled cylinder is inserted through a seal member made of an elastic material, said seal member comprising a cylindrical member having an outer flange at its front end and an inwardly warped piece integrally formed together at its rear end periphery; said seal member, with its cylindrical member inserted between the opening of said gas chamber and the viscous agent filled cylinder, being tightly fixed at its outer flange to the inner periphery of said gas chamber and at the same time, the rear end periphery of the viscous agent filled cylinder being held by and between the cylindrical member and the inwardly warped piece. 3. A viscous agent injecting instrument according to claim 1 further including a safety valve for degasing the pressurized gas from said flow passage or said gas chamber, said safety valve being arranged as such that it is shut at the time when the viscous agent filled cylinder is inserted in said gas chamber and opened at the time when the viscous agent filled cylinder is removed from said gas chamber.

4. A viscous agent injecting instrument according to claim 1 further including an elastic tube for permitting the viscous agent to pass therethrough and inserted within said injection control valve so that said elastic tube is opened and shut in accordance with the opening and shutting action of said injection control valve.

5. A viscous agent injecting instrument according to claim 1 wherein said elastic tube includes a fitting opening, through which said elastic tube is fitted to the injection port of the viscous agent filled cylinder, whereby an inner wall surface of the end periphery of the fitting opening of said elastic tube is formed with a peripheral groove.

6. A viscous agent injecting instrument according to claim 5, wherein said peripheral groove is formed in a V-shape, a smooth

tapered portion being formed at one end of said peripheral groove.

7. A viscous agent injecting instrument according to claim 4, wherein a front end of said elastic tube is projected from a nozzle of said injection control valve, said elastic tube being covered with a heat contracting sheet having a rigid property from its front end to said injection control valve.

8. A viscous agent injecting instrument according to claim 7, wherein said heat contracting sheet is a cylindrical member.

9. A viscous agent injecting instrument according to claim 7, wherein said heat contracting sheet is fitted into said injection control valve.

10. A viscous agent injecting instrument according to claim 8, wherein said heat contracting sheet is fitted into said injection control valve.

11. A viscous agent injecting instrument according to claim 7, wherein said heat contracting sheet is fitted onto said injection control valve.

12. A viscous agent injecting instrument according to claim 8, wherein said heat contracting sheet is fitted onto said injection control valve.

13. A viscous agent injecting instrument according to claim 1, wherein a valve casing of said injection control valve is inserted in an injection port of the viscous agent filled cylinder through an elastic seal member.

14. A viscous agent injecting instrument according to claim 1 further including pressure reducing means disposed between said pressurized gas source and said gas chamber, pressure reducing rate of said pressure reducing means being made adjustable.

15. A viscous agent injecting instrument according to claim 1 which includes a basic body, said gas chamber having an opening and a receiving seat and provided at a rear portion of the basic body, with the opening facing forward, said receiving seat being provided at a front portion of said basic portion, said receiving seat being provided with an injection control valve, the viscous agent filled cylinder being inserted at its rear portion in the opening of said gas chamber, an injection nozzle at its front portion being connected to said injection control valve, whereby a seal member is provided at the periphery of the opening of said gas chamber, the viscous agent filled cylinder being slidingly movable while maintaining an air-tight state of the viscous agent filled cylinder with respect to said seal member and at the same time, said receiving seat being pivotable around an axis of the back and forth direction of said basic body with respect to said basic body.

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